

Transition of AIRS Products to the National Weather Service

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Spring 2012 AIRS Science Team Meeting

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transitioning unique NASA data and research technologies to operations



Outline

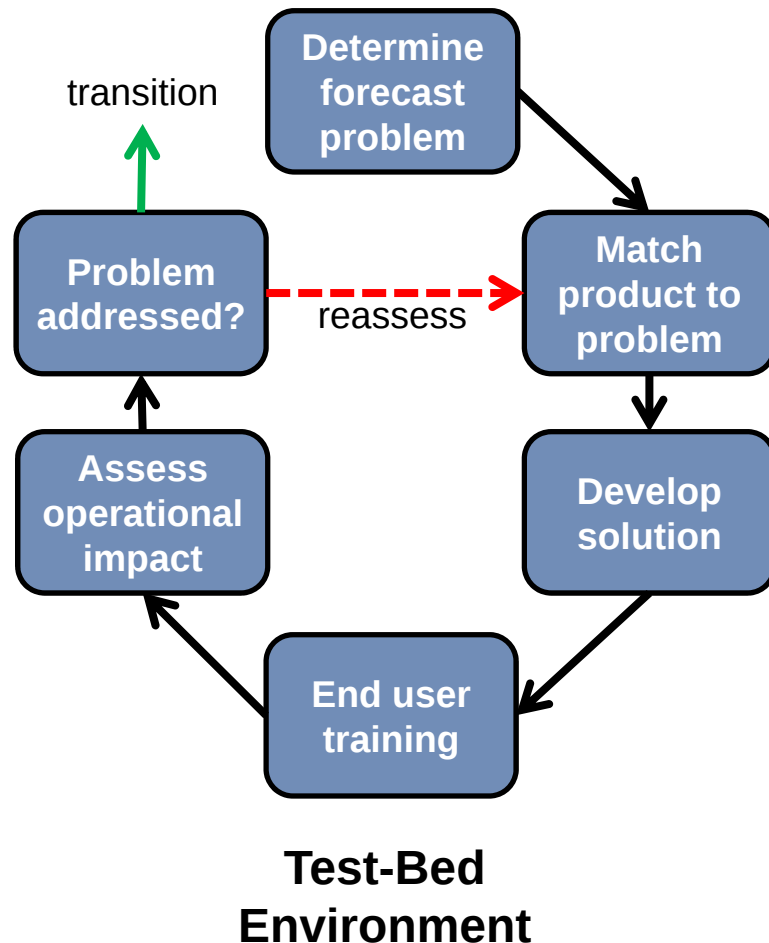
- SPoRT Paradigm/Overview
- Operational Transition Activities
- Testbed Transition Activities
- Initial V5 vs V6 Comparisons



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SPoRT Mission and Paradigm



- *Apply satellite measurement systems and unique Earth science research to improve the accuracy of short-term weather prediction at the regional and local scale*
- Bridge the “Valley of Death”
- Can’t just “throw data over the fence”
 - Maintain interactive partnerships with help of specific advocates or “satellite champions”
 - Integrate into user decision support tools
 - Create forecaster training on product utility
 - Perform targeted product assessments with close collaborating partners
- Concept has been used to successfully transition a variety of satellite datasets to operational users for nearly 10 years

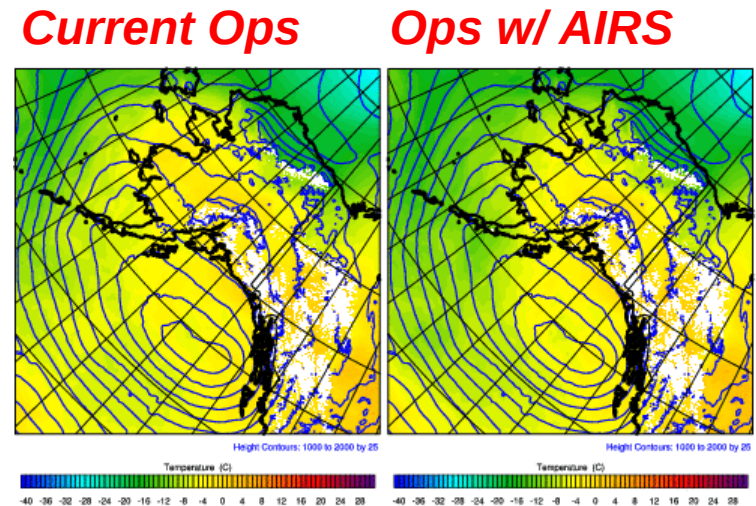


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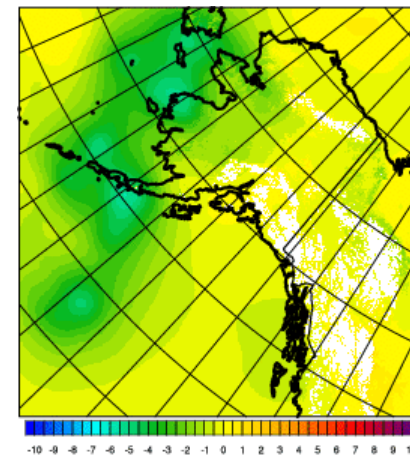


AIRS T and q profiles in HRRRAK

- Collaboration between MSFC/SPoRT and the Alaska Region Supercomputing Center (ARSC) partially funded by Alaska Space Grant Program
- Using Gridpoint Statistical Interpolation (GSI) to assimilate AIRS thermodynamic profiles into High-Resolution Rapid Refresh for Alaska (HRRRAK) employed by National Weather Service offices to improve short-term forecasts
- SPoRT has provided real-time QC'd AIRS T and q profiles from LANCE in necessary format
- First real-time forecasts generated starting at the end of March 2012 (see image at right)
- Full transition of code to ARSC for processing AIRS profiles is scheduled for early summer 2012
- Will work with ARSC to implement V6 once online this summer



AIRS Analysis Increment



**850 hPa
temperature
analyses for
sample day
valid 30 March
2012 at 0000
UTC**

Images from Don Morton and Kayla Harrison (ARSC/UAF)



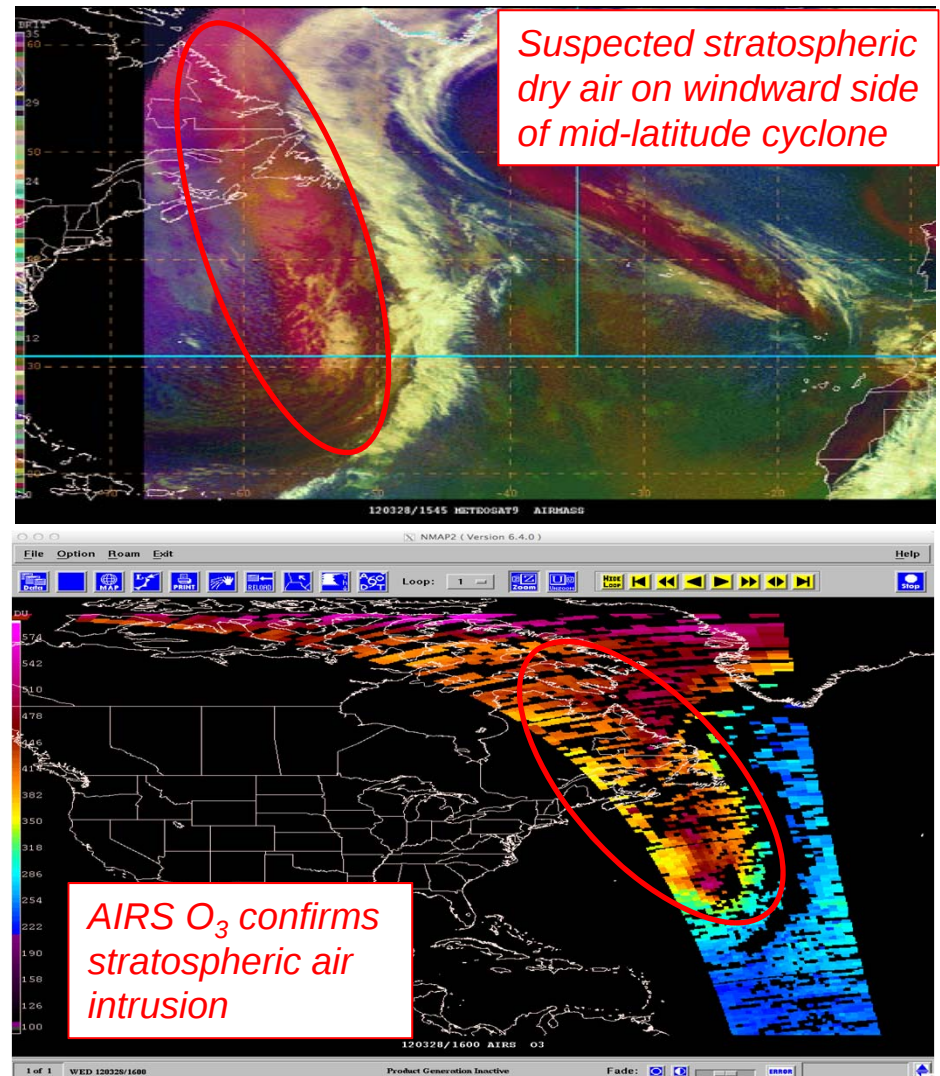
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AIRS Total Ozone at HPC/OPC

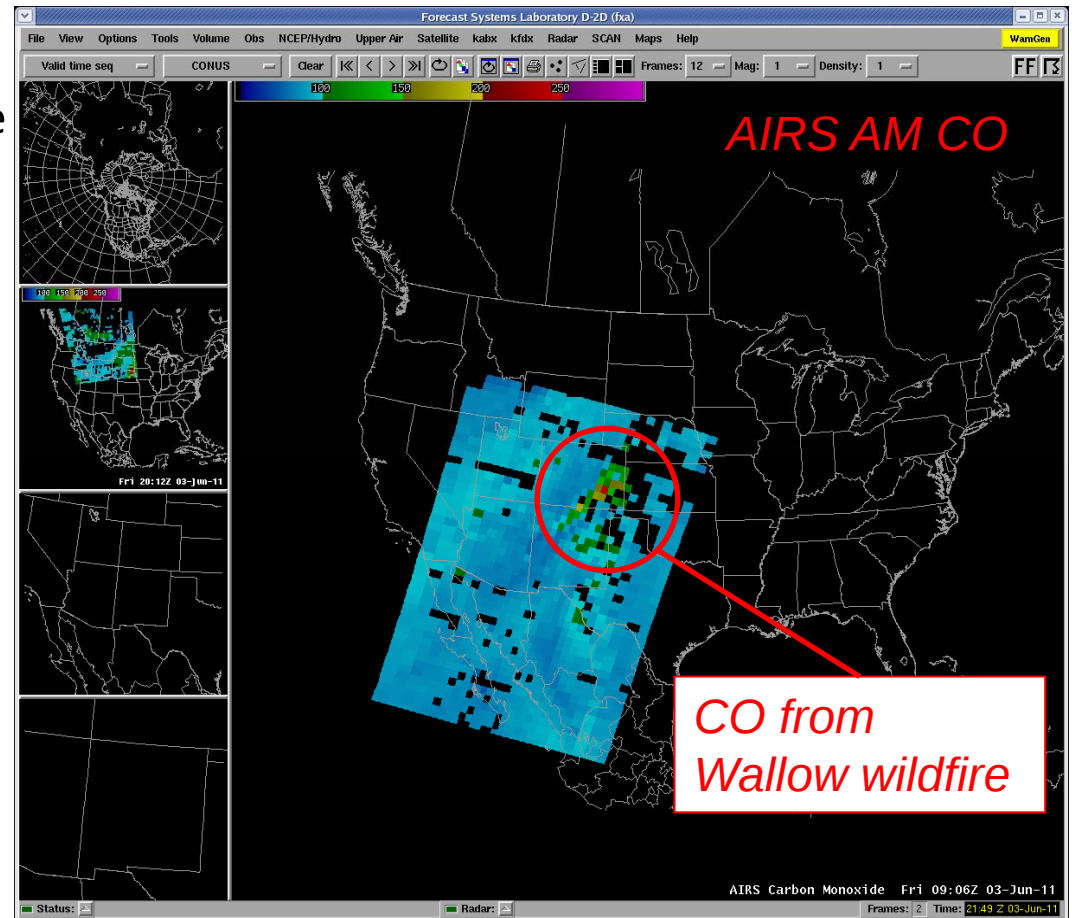
- AIRS helps determine stratospheric ozone intrusions associated with mid-latitude and extratropical cyclone strengthening
- Enhances interpretation of RGB products
- Full transition of product to Hydrometeorological Prediction Center (HPC) and Ocean Prediction Center (OPC) into N-AWIPS decision support system completed this week
- Working with forecasters from HPC/OPC to see if total ozone or some subset of the ozone profile is best for this application

Images from Michael Folmer (HPC/OPC)
and Andrew Molthan (SPoRT)



AIRS CO with NWS WFOs

- NWS offices issue fire hazard and public health warnings
- Clouds and smoke can look the same in satellite imagery; visible imagery not available at night
- Enhances use of satellite imagery by using the CO as a proxy for smoke location
- CO can also be a tracer that moves out ahead of particulate matter that causes health concerns to indicate direction of atmospheric motion
- Currently working with Albuquerque and Great Falls to get this product into their WFOs



Images from Frank LaFontaine (SPoRT)

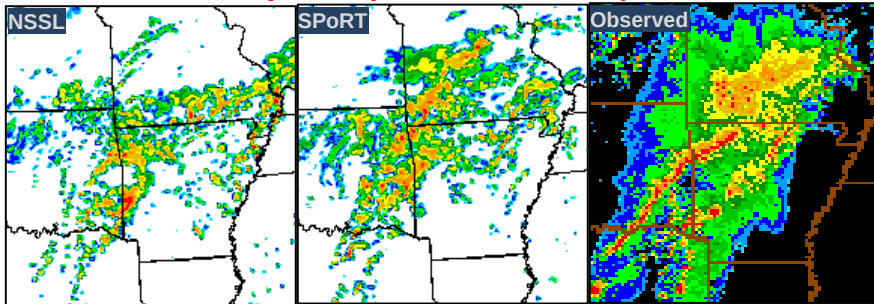


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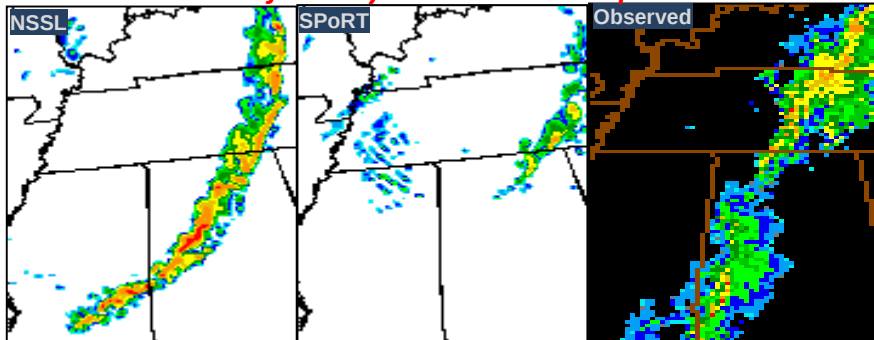


AIRS T and q in SPoRT-WRF

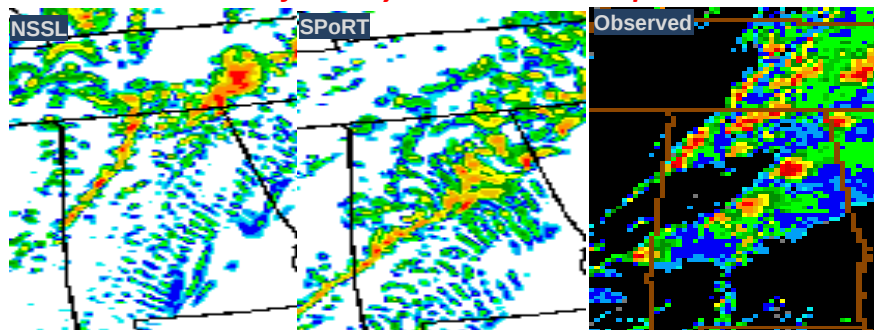
1-km Reflectivity at 2100 UTC 25 April 2011



1-km Reflectivity at 1500 UTC 26 April 2011



1-km Reflectivity at 0000 UTC 28 April 2011



Images from Danielle Kozlowski (SPoRT Intern)

- AIRS T and q profiles can aid in improving short-term forecasts of moisture and atmospheric stability important for regional convective forecasts
- AIRS profiles were assimilated into a version of the SPoRT-WRF, which was evaluated last spring at the Hazardous Weather Testbed's (HWT) Experimental Forecast Program
- Forecasts from AIRS produced mixed results with many of the forecasts being cooler and drier than no-AIRS forecasts
 - Possible cool/dry bias in V5 profiles
 - Non-cycling DA approach
- Will continue to demonstrate value of AIRS profiles to HWT in this year's SPoRT-WRF

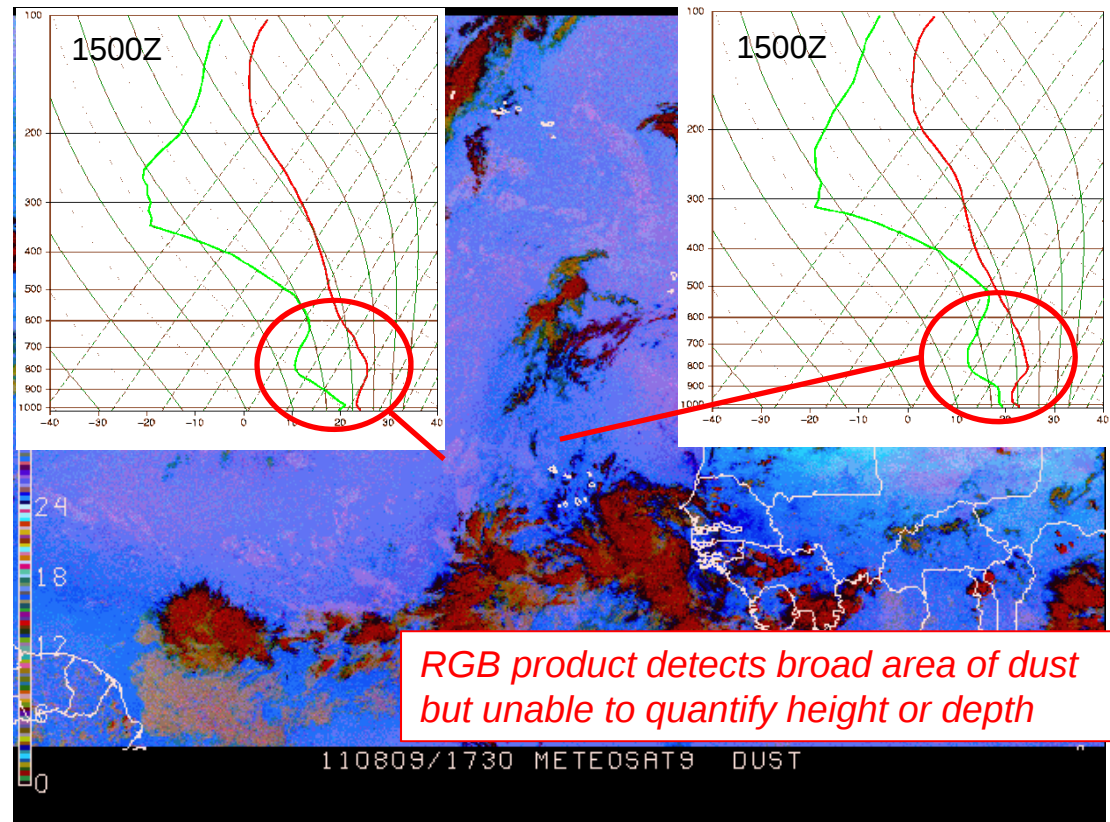


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Saharan Air Layer Detection from AIRS

- Hurricane Research Division (HRD) has been interested in using AIRS to detect dry, dust-laden air that influences hurricane development in eastern Atlantic
- Collaborative project with HRD and OPC to evaluate SAL detection
- Very preliminary results indicate that AIRS may have some ability to detect SAL
- Have had some problems using dust_flag and dust_score variables in L2 support products (see backup slide)

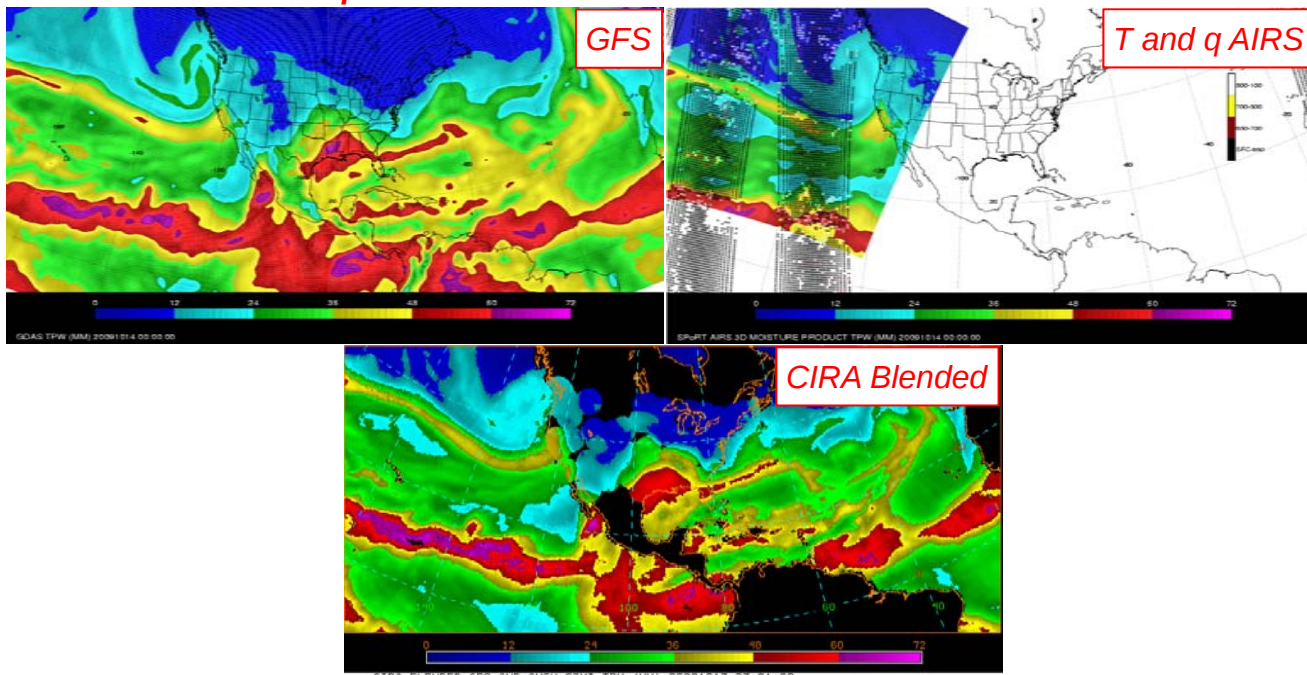


RGB image from Michael Folmer (HPC/OPC)

AIRS-Enhanced 3D Moisture Analysis

- Only TPW satellite observations available over Pacific to track moisture features; models provide some additional guidance
- AIRS T and q add detail around clouds resulting in more favorable moisture analysis over Pacific than real-time GFS analysis
- Evaluate integrated water vapor in specific layers and vapor fluxes

Total Precipitable Water valid at ~0000 UTC on 2009 October 14

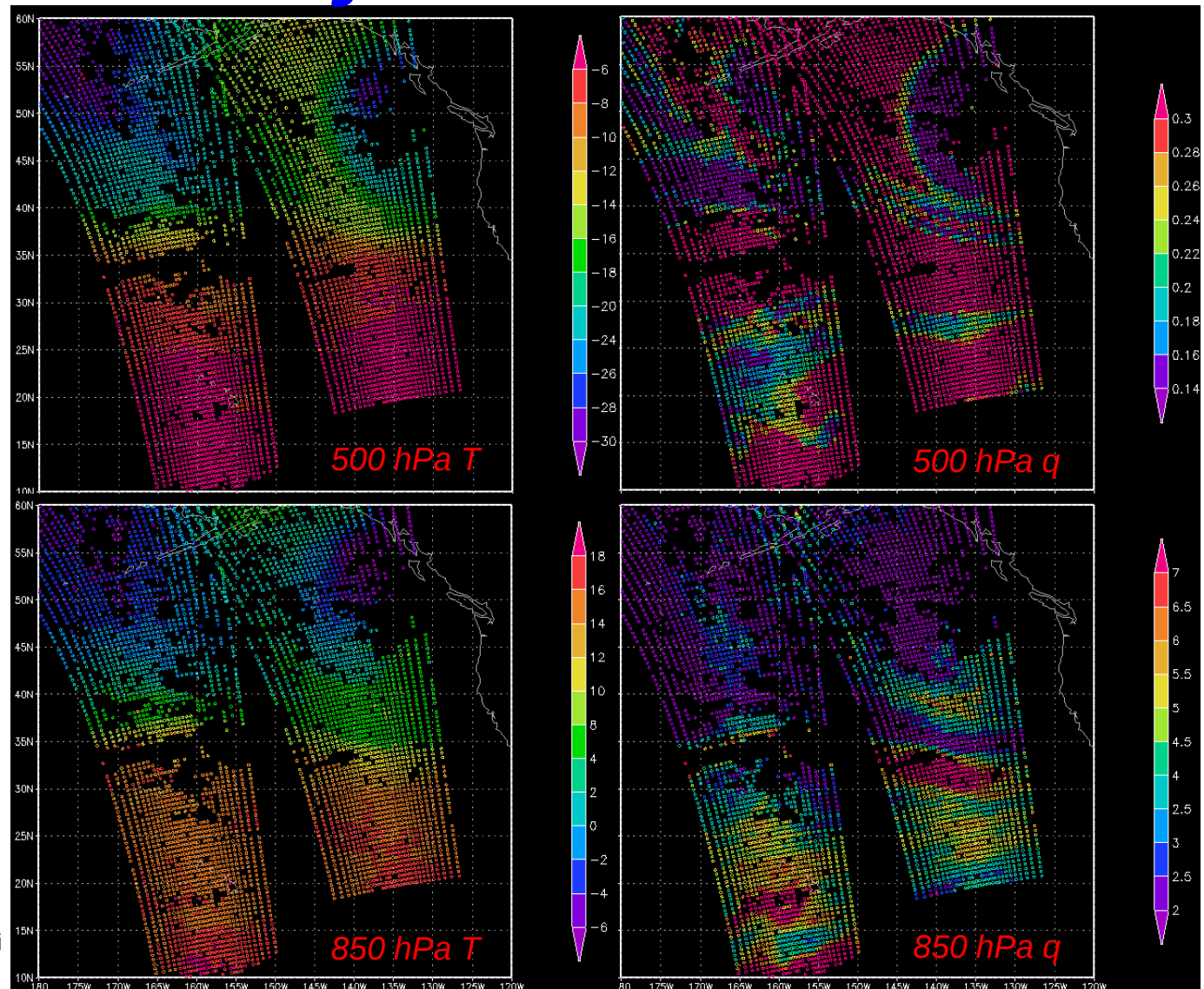


- Working with the Hydrometeorological Testbed (HMT) to evaluate impact of AIRS on atmospheric river analyses/forecasts
- SPoRT plans to produce daily real-time layered moisture analyses using AIRS, IASI, and CrIS

Comparison of V5 vs V6 Data

- V6 provides increased retrieval yields that appear consistent with atmospheric patterns
- V6 eliminates some of the cool/dry bias that appears in V5

Images from Shih-Hung Chou and Jayanthi Srikishen (SPoRT)



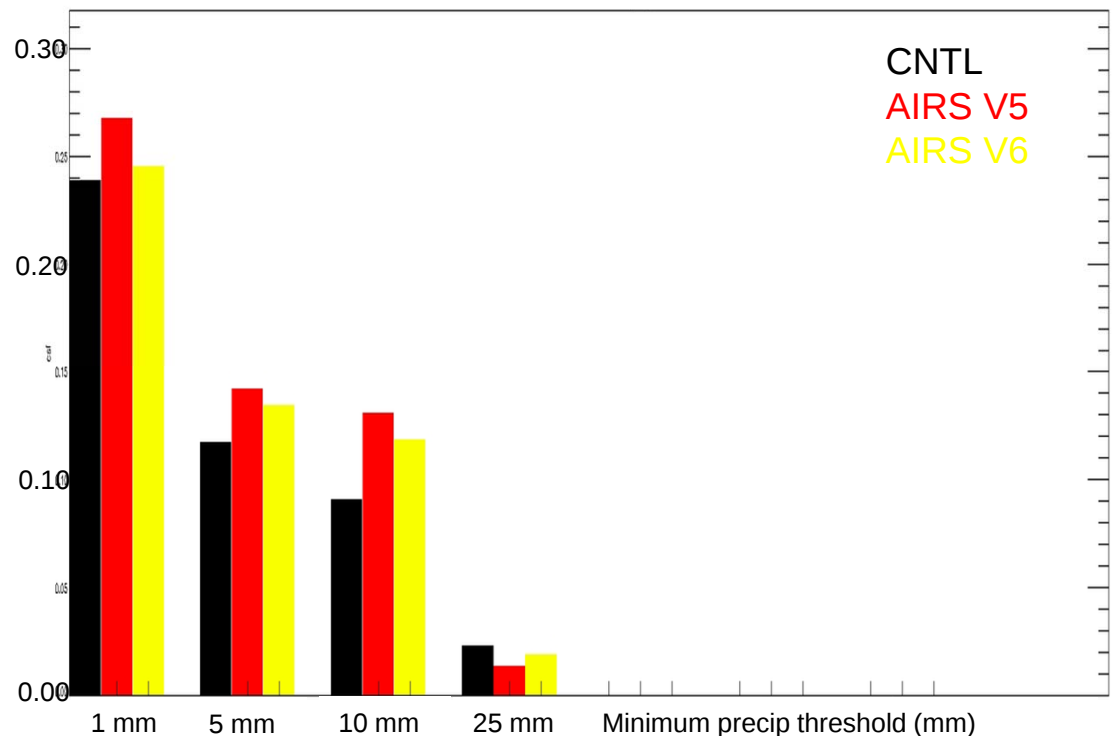
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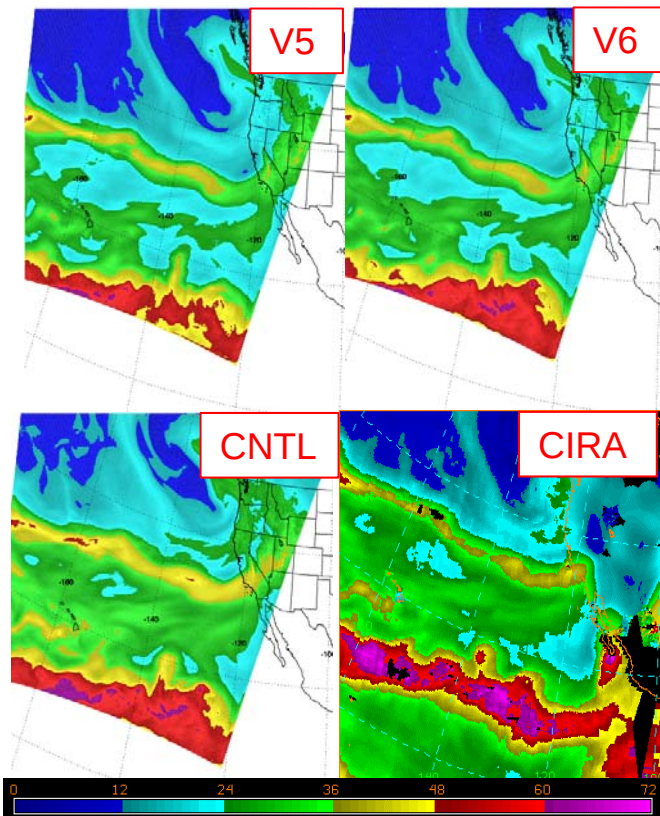
Comparison of V5 vs V6 Forecasts

- Subtle differences between V5 and V6 TPW forecasts; AIRS produces more realistic-looking atmospheric river feature than CNTL
- AIRS improves precipitation forecasts at most precipitation times and most thresholds; however, at this time it is unclear whether V6 provides improved precipitation forecasts

Critical Skill Index for 6-hr accumulated precipitation for 12-h forecast valid 1200 UTC 10/14/09



12-hr TPW forecast valid 1200 UTC 10/14/09



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Summary

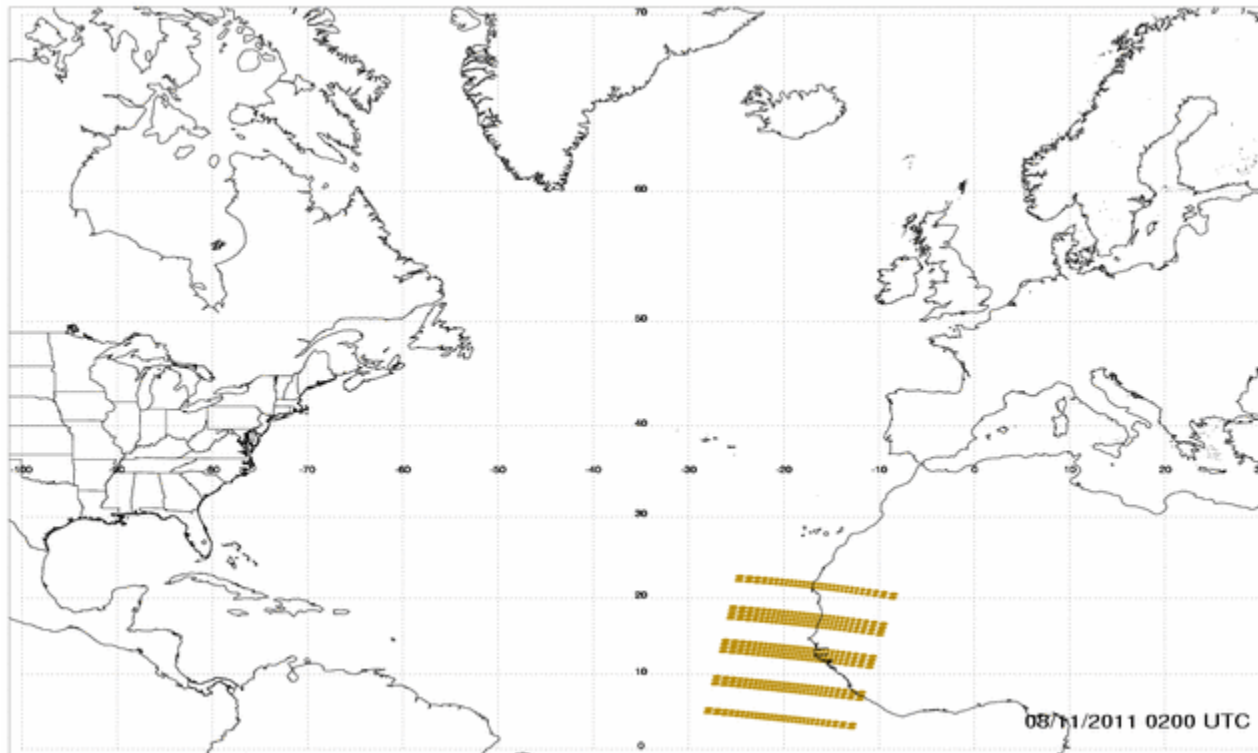
- SPoRT is a proven community leader for transitioning satellite products to operational end users and is working hard to bring data from AIRS to forecasters
- SPoRT products using AIRS data are currently or will soon be evaluated at WFOs and National Centers
 - T and q profiles: HWT, Alaska WFOs, HRD/OPC, HMT
 - Ozone profiles: HPC/OPC
 - Carbon Monoxide: Southern and Western Region WFOs
- SPoRT is actively evaluating differences between V5 and V6 profiles for selected cases and will continue to provide feedback to the AIRS team as V6 development efforts conclude



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Backup Slides

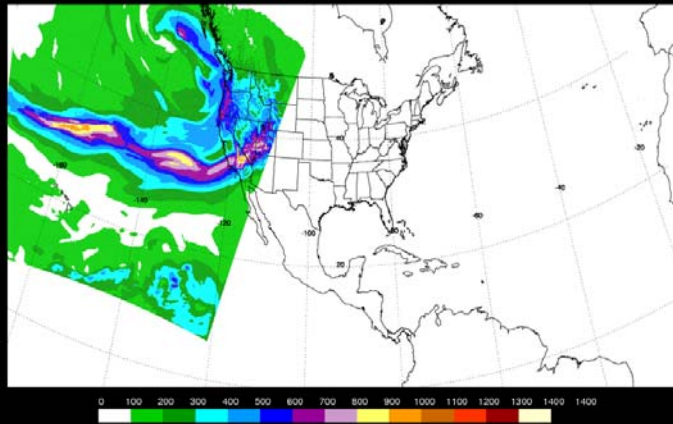


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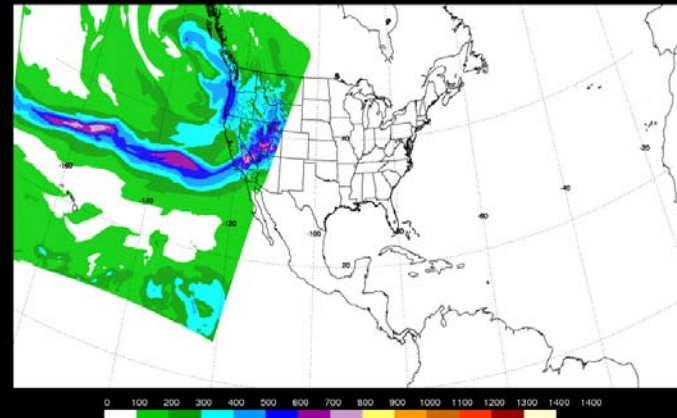
Backup Slides

CNTL



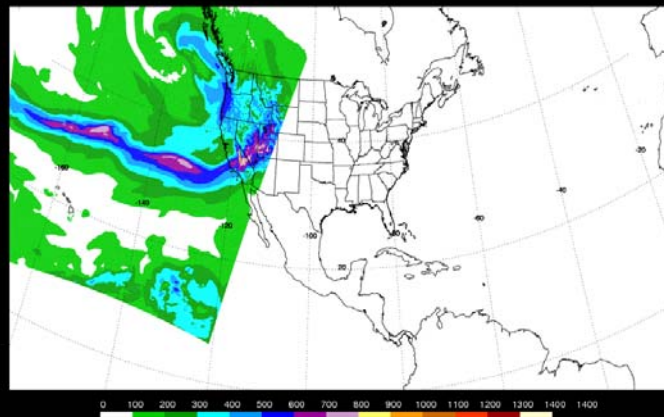
CNTRL Moisture Transport Product ($\text{kgm}^{-1}\text{s}^{-1}$) 10/14/09 12:00:00 (Forecast 12)

AIRS V5



(Forecast 12)

AIRS V6



AIRS6 Moisture Transport Product ($\text{kgm}^{-1}\text{s}^{-1}$) 10/14/09 12:00:00 (Forecast 12)

*Integrated Vapor
Transport ($\text{kgm}^{-1}\text{s}^{-1}$)
product for 12-hr
forecast valid
10/14/2009 1200 UTC*



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